

# ***Conversion Factors and Unit Cancellation***



**A physical quantity must include:**

**Number + Unit**



## Calculation Corner: Unit Conversion

**1 foot = 12 inches**

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# Calculation Corner: Unit Conversion

$$\begin{array}{r} \mathbf{1 \text{ foot}} \\ \hline \mathbf{12 \text{ inches}} \end{array} \qquad \begin{array}{r} \mathbf{12 \text{ inches}} \\ \hline \mathbf{1 \text{ foot}} \end{array}$$

**“Conversion factors”**

# Calculation Corner: Unit Conversion

$$\frac{1 \text{ foot}}{12 \text{ inches}} \qquad \frac{12 \text{ inches}}{1 \text{ foot}}$$

**“Conversion factors”**

$$\left( \cancel{3 \text{ feet}} \right) \left( \frac{12 \text{ inches}}{\cancel{1 \text{ foot}}} \right) = 36 \text{ inches}$$

How many cm are in 1.32 meters?

equality: 1 m = 100 cm (or 0.01 m = 1 cm)

applicable conversion factors:

$$\frac{1 \text{ m}}{100 \text{ cm}} \quad \text{or} \quad \frac{100 \text{ cm}}{1 \text{ m}}$$

$$X \text{ cm} = 1.32 \text{ m} \left( \frac{100 \text{ cm}}{1 \text{ m}} \right) = \boxed{132 \text{ cm}}$$

We use the idea of **unit cancellation** to decide upon which one of the two conversion factors we choose.



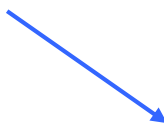


How many meters is 8.72 cm?

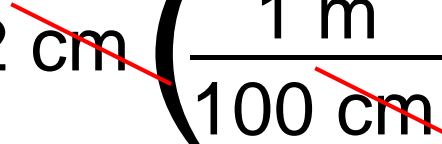
equality: 1 m = 100 cm

applicable conversion factors:

$$\frac{1 \text{ m}}{100 \text{ cm}} \quad \text{or} \quad \frac{100 \text{ cm}}{1 \text{ m}}$$



$$X \text{ m} = 8.72 \text{ cm} \left( \frac{1 \text{ m}}{100 \text{ cm}} \right) = \boxed{0.0872 \text{ m}}$$



Again, the units must cancel.



How many feet is 39.37 inches?

equality: 1 ft = 12 in

applicable conversion factors:



$$\frac{1 \text{ ft}}{12 \text{ in}} \quad \text{or} \quad \frac{12 \text{ in}}{1 \text{ ft}}$$

$$X \text{ ft} = 39.37 \text{ in} \left( \frac{1 \text{ ft}}{12 \text{ in}} \right) = 3.28 \text{ ft}$$

Again, the units must cancel.



How many kilometers is  
15,000 decimeters?



$$X \text{ km} = 15,000 \text{ dm} \left( \frac{1 \text{ m}}{10 \text{ dm}} \right) \left( \frac{1 \text{ km}}{1,000 \text{ m}} \right) = 1.5 \text{ km}$$



How many seconds  
is 4.38 days?



$$\begin{aligned} X \text{ s} &= 4.38 \text{ d} \left( \frac{24 \text{ h}}{1 \text{ d}} \right) \left( \frac{60 \text{ min}}{1 \text{ h}} \right) \left( \frac{60 \text{ s}}{1 \text{ min}} \right) \\ &= \boxed{378,432 \text{ s}} \end{aligned}$$

If we are accounting for significant figures, we would change this to...

$$\boxed{3.78 \times 10^5 \text{ s}}$$

